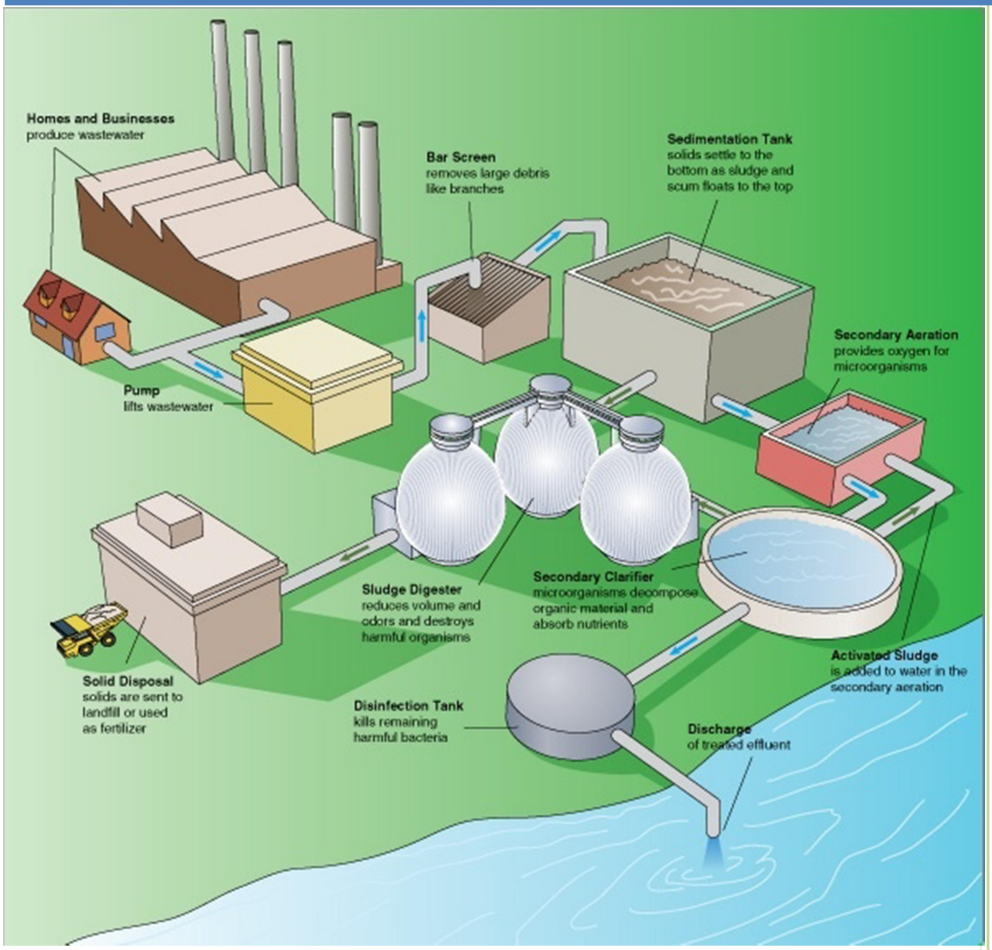
SEPT-X®

Wastewater Treatment Solution

SEPT-X™ Wastewater Treatment Application Manual



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BNA
BioNatural America
INSTITUTE

1.1 Introduction:

This manual has been developed to assist wastewater professionals with introducing SEPT-X™ into their wastewater treatment applications. SEPT-X™ is a green technology that is positioned to deliver significant cost and environmental benefits to the wastewater treatment industry. The key is understanding and following the implementation recommendations contained within this technical manual.

This manual has been written to provide background information and implementation details on applicable SEPT-X™ product and has been set out as follows:

SECTION 1

Section 1 is an **Overview of SEPT-X™**. This section provides detail on the technology behind how SEPT-X™ works, available products and key information on the principles of use.

SECTION 2

Section 2 covers the **Key Value Drivers/Benefits** of using SEPT-X™. This section simply covers the potential benefits of using SEPT-X™ in a wastewater treatment process.

SECTION 3

Section 3 provides details on **Introducing SEPT-X™ to a Wastewater Treatment Process.** This section is designed to assist wastewater treatment professionals in selecting the right dosing program for their application.

SECTION 4

Section 4 provides **Dosing Programs** information. It contains detailed information on applicable dosing programs. This section includes suggestions on how to monitor the impact of the **SEPT-X™**.

SECTION 5

Section 5 provides information on **SEPT-X™ MSDS**, including details on material safety, handling, full product descriptions and how the product is stored.

SECTION 6

Section 6: **Case Studies**

SECTION 7

Complete business proposal to be introduced for wastewater treatment plants.

SECTION 8

Test of SEPT-X for waste water treatment in laboratory, How to test quality of the treatment.

SECTION 9

Work Method statement for SEPT-X in WWTPs.

SECTION 10

Commercial information, terms and prices.

For further information on any of the topics covered in this manual or additional assistance contact SEPT-X™ technical support on techsupport@SEPT-X.com

1-Overview of SEPT-X™

1.1 Introduction

This section provides information on SEPT-X™ technology, the types of SEPT-X™ products recommended for water treatment plants and key principles of use. This section is directed at wastewater professionals who want to have an understanding of the technology and the core considerations when selecting and using SEPT-X™ products.

1.2 What is the SEPT-X™ technology?

SEPT-X™ is a green microbial technology consisting of three beneficial bacteria and two yeasts acting in symbiosis, creating enzymes and powerfully working to digest fats, protein, carbohydrates, cellulose, foul organic odor and waste products. This technology makes SEPT-X™ perfect for a wide range of diverse applications.

1.3 Types of SEPT-X™ Products for wastewater treatment applications

The following table provides a brief description of SEPT-X™ products for the treatment of commercial/industrial wastewater, animal agriculture and consumer segments. This manual is specific to commercial/industrial and animal agriculture products. Please note that the consumer products have been listed for information and are pertinent to smaller residential applications. (Information on these products can be found on the SEPT-X™ website and products are available through major retail chains).

For details of packaging and specific information relating to commercial/industrial and animal agriculture products refer to:

1.3.1 SEPT-X™ Products for wastewater treatment applications:

1.3.1.1 Products for Commercial/Industrial Applications

	**SEPT-X™** SEPT-X™ has been specifically designed for wastewater treatment applications and has excellent wastewater treatment and odor control properties. SEPT-X™ deals with a wide range of organic waste streams and is particularly well suited to nitrification and de-nitrification applications.
	**SEPT-X™ PLUS** SEPT-X™ PLUS has been specifically designed for water treatment applications that have a high content of fats, oils and/or grease. This product is highly effective on mineral and organic forms of fat, oil and/or grease, and is used in applications where fat/oil/grease content is greater than 200mg/Litre.
	**Farm360** FARM360 has been developed specifically to reduce odors and assist in accelerated manure decomposition in concentration animal feed operations it is especially formulated for maximum effectiveness in swine, poultry, beef and dairy farms.

1.3.1.2 Products for Residential Applications

SEPT-X™ H

SEPT-X H prevents blocked septic systems. Use this product every 3 months to boost septic system performance. Active SEPT-X™ enzymes rapidly breakdown accumulated bottom sludge and scum layers inside your septic tank. This product comes in small, easy to administer packs. Simply add contents to the bowl and flush to activate SEPT-X™ enzymes.

1.4 Key Principles of Use

There are five variables that most impact the effectiveness of SEPT-X™:

1. **Concentration**. There is a wide range of effective concentrations or "doses" of SEPT-X™ for certain applications; however, the optimum range is generally between 0.5 and 10 milligrams per liter of volume—that is milligrams of SEPT-X™ per liter of wastewater or substrate. This is roughly equivalent to parts per million.
2. **Contact time**. To maximize the SEPT-X™ treatment program, SEPT-X™ should be kept in contact with the target substrate to the greatest extent possible. This means that when applying SEPT-X™ to a large volume of wastewater, such as a large lagoon, tank or vessel, it is important to maximize the distribution of SEPT-X™ throughout that medium. Additionally, the frequency of SEPT-X™ dosing should match or exceed residence time within the wastewater system. For example, if a septic tank has a residence time of 14 days, then SEPT-X™ should be applied at least every 14 days. If a grease trap fills and empties completely every day, then daily dosing or continuous application of SEPT-X™ would be advised.
3. **Temperature**. SEPT-X™ can operate effectively in a wide range of temperatures. However, the catabolic breakdown of organic waste molecules into inert compounds slows significantly as the temperature of the substrate approaches the freezing point (32°F/0°C). There is a similar loss of effectiveness at temperatures above approximately 140°F (60°C). The ideal operating temperature is between 50°F and 120°F (10°C to 49°C). This broad operating range makes SEPT-X™ a suitable treatment for effluent lagoons, sludge drying beds and effluent storage basins in most climates during most times of the year.
4. **PH**. SEPT-X™ operates within a broad pH range, from 2.5 and 9.5, but the optimum pH is between 3.5 and 7.5.
5. **Oxygen levels**. When using SEPT-X™ in an aerobic process the performance of SEPT-X™ can be vastly improved by higher levels of dissolved oxygen. Optimal levels in aerobic processes are DO>1.5mg/L. SEPT-X™ is still very effective in anaerobic processes.

1.5 Pre-activation of SEPT-X™

SEPT-X™ wastewater application products are packaged in a freeze-dried powder form, delivered in vacuum-sealed bags. The powder must be pre-activated by mixing into solution with water before being applied to the wastewater or target medium. This step allows SEPT-X™ to properly culture and form a high concentration of catalysts. Several factors govern the effectiveness of this SEPT-X™ dose pre-activation phase:

Pre-Activation Time. The appropriate time for preparing a SEPT-X™ culture is between 12 and 24 hours. Too little time will result in a less optimal concentration of catalysts, while too much time may cause SEPT-X™ to run out of its nutrient source and lose viability. Each package contains a proper amount of nutrient to sustain SEPT-X™ during the pre-activation phase.

Concentration. For pre-activation, SEPT-X™ should be mixed into solution with water at a concentration between 2,000 and 10,000 milligrams of SEPT-X™ per liter of water (parts per million). The ideal concentration is approximately 5,000 mg/L. Because SEPT-X™ is packaged with its own nutrient source, it is important to use a relatively nutrient-free source of water for pre-activation mixing.

Temperature. The range of optimum temperature for pre-activating SEPT-X™ is not as broad as its effective temperature range once activated. It is ideal to keep the pre-activation culture at a temperature above 60°F (16°C) and below 100°F (38°C).

Oxygen. The SEPT-X™ pre-activation culture requires adequate oxygen. In some cases—particularly when large volumes of product are being mixed into a pre-activation solution—some mechanical means of aeration is advisable. In most cases it is sufficient to simply leave the solution container uncovered and exposed to ambient air throughout the pre-activation period.

Quality of water used. The SEPT-X™ activation is a biological process. It is important that the water used does not contain any process that would inhibit the growth of the SEPT-X™ Culture. Water with antimicrobial agents should not be used.

1.5.1 Steps of Pre-activation:

1.5.1.1 Equipment

- 1 x 100 Liter Clean Tank
- 2 x Fish Tank Air Pumps (recommended that each is to be equipped with two air outlets)
- 1 x Fish Tank Cleaning Motors (Filters are to be completely removed.)
- 1 x Temperature Gauge
- 1 x pH Gauge

1.5.1.2 Procedures

- Install the fish tank cleaning motor at the bottom of the tank (make sure the filters are completely removed).
- Install the outlets of one of the Fish Tank Air Pumps at the bottom of the water tank.
- Fill the water tank with 95 liters of standard tap water.
- Keep the fish tank cleaning motors and air pumps running for 120-minutes before applying the dose.
- After two hours of continuous aeration to the water, a dose of 1000grams is to be applied for every 95 liters of water.

1. Once the dose has been applied; the second fish tank air pump is to be applied to the tank.
2. After starting the 4th hour of the application of the product into the water, the pH value and the temperature are monitored every hour.
3. Once the temperature starts to rise above 30 degrees Celsius, this is an indication that the solution is starting to reach the maturity time. Thus, both the pH and the temperature are to be monitored every 30 minutes and not every hour, and the later applied air pump is to be stopped and only the pump at the bottom is to be kept running with the cleaning motor.
4. Once the pH value starts moving below 7 and/or the solution temperature starts reaching towards the 37 degrees Celsius this means that the solution is in its prime condition. The solution is then to be applied to the media subject of treatment within a maximum of one hour, and in this case the air pump is to be stopped once any of the above conditions (pH = 6 or temperature = 37 degrees) are reached, and one of the two outlets of the air pump is to be removed.
5. If the solution reaches this condition and is kept unused for more than two hours, the pH value will rise again. This is an indication that some of the bacterial strains have started dying and thus the solution will lose a good portion of its efficiency.

1.5.1.3 Special Cases

1. The above referred conditions would usually take anywhere between 12-18 hours for completion of pre-activation, depending on the quality of the pre-activating water, room temperature and strength of the air pumps being used for aeration.

2. If in a special case the pre-activation is required to be completed within a very short duration, 50mL of Glucose is to be added to the solution, with the water filling at the beginning stage which will bring down the pre-activation time to no more than 3-5 hours. However, this application makes the pre-activation procedure very aggressive, and if the solution is not used quickly upon reach of the prime point we will lose multiple strains of the bacteria in the solution.

1.5.1.4 Method of addition:

- In large scale systems like activated sludge and lagoons, add SEPT-X powder to the dosing tank and make it an automatic release SEPT-X solution (see Dosing Tank). To make the most effective microbe, the application should activate the microbes by aeration (adding oxygen to the tank) before using for 24-48 hours, and continue activation by continuous automatic release.
- In other systems like restaurants, apply by mixing SEPT-X 100 gram/100-200 litres of water, then adding oxygen to activate microbes. Use this clear solution to wash/clean all material, floors and dishes, and add in the sump or waste water collector. In the waste water collector there should be aeration or the addition of oxygen from the bottom of the sump or pond.
- In a small pond, SEPT-X may be added in a sachet bag then put in a basket and kept in front of the inlet flowing to the pond. This will be an automatic aeration.

1.5.1.5 Dosing Programs

- SEPT-X™ can be used both for system rehabilitation and for ongoing system maintenance. Dosing programs designed to rehabilitate an underperforming wastewater system typically include initial “shock” doses that steadily decrease in amount and frequency over time. Once the system is performing as desired, a maintenance dosing program can commence and continue indefinitely to keep the system running optimally. Shock doses can be on the order of 4 to 10 times the dosage required for ongoing maintenance. Additionally, where wastewater enters the treatment application such as a facultative lagoon the influent is also dosed with a small amount of SEPT-X™.
- In other cases, a progressive approach to rehabilitation dosing can be more appropriate. In instances where a rapid re-activation of large amounts of dormant sludge in a wastewater treatment system cannot be accommodated, SEPT-X™ doses may be phased in slowly to effect a more long-term rehabilitation of the system.
- In some cases a “shock” or rehabilitation program will also require dosing of SEPT-X™ to the influent.
- The correct dosing program by application is presented in Section 4: Introducing SEPT-X™ to a Wastewater Treatment Process. Each dosing program is then detailed in Section 4.

1.6 Use of SEPT-X™ in tandem with other technologies

SEPT-X™ can work synergistically with many existing technologies that enhance wastewater operations:

a) The use of a system of aeration—especially in an effluent storage lagoon or tank—works well to provide more oxygen to optimize the effectiveness of SEPT-X™.
b) The use of mechanical mixing and scouring technologies that improve the circulation of solids throughout the water column will assist in maximizing the contact of SEPT-X™ catalysts with the substrate.
c) Lift stations and pumps that pressurize the effluent from a treated septic tank can be ideal in helping to more quickly conduct SEPT-X™ enzymes through the septic system and on into the leach field, where it can continue to break down organic solids even into the soil formation underlying the leach bed, thereby improving percolation.

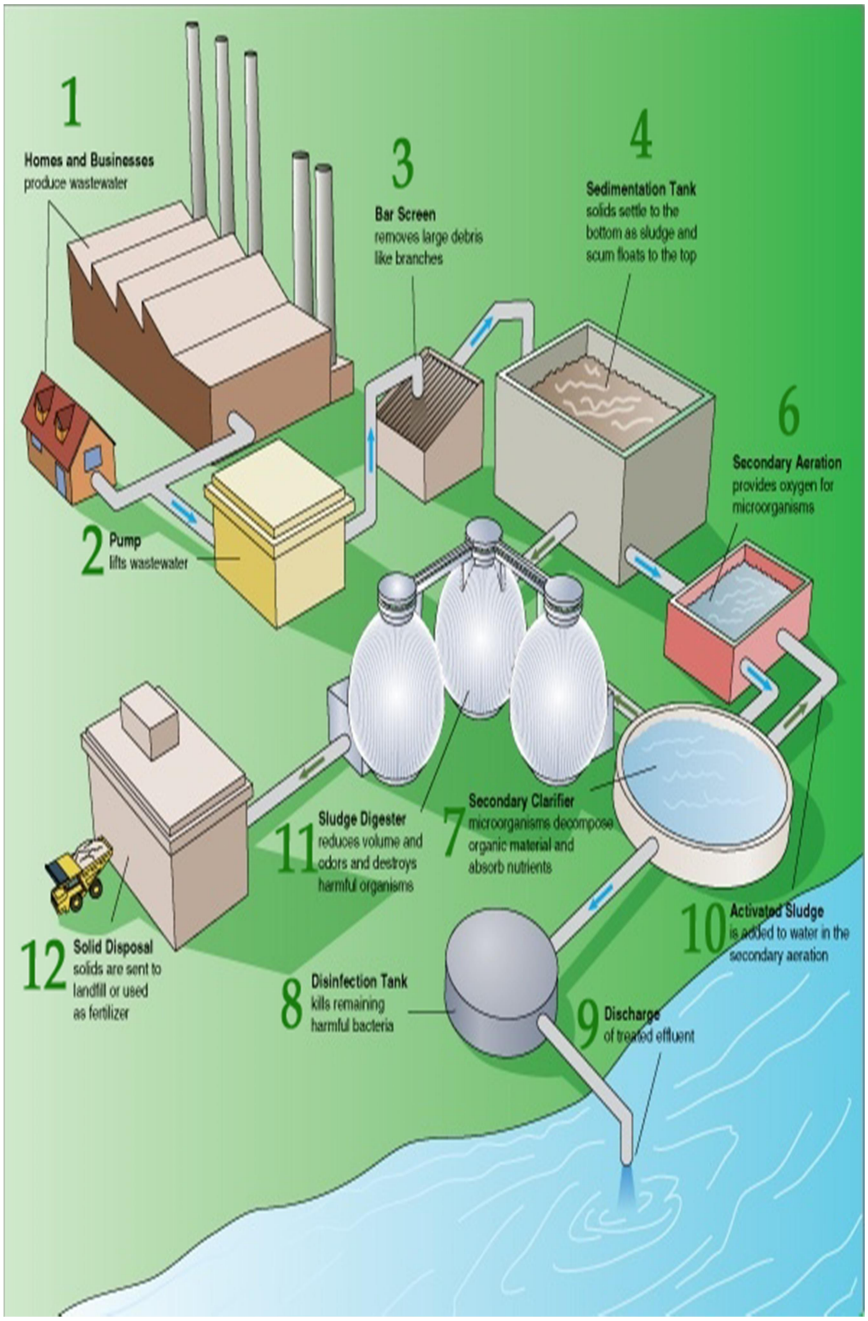
SEPT-X™ is ***not compatible*** with most chemical anti-microbial and anti-fungal agents such as those commonly used in many types of commercial toilets or septic systems. These broad spectrum biocides are specifically designed to inhibit biological activity. Please note that SEPT-X™ products do have anti-microbial and anti-fungal properties and dependent on application it may be possible to substitute SEPT-X™ in lieu of hazardous chemicals.

1.7 Online Support

For further information or technical support please contact us through our website address techsupport@SEPT-X.com. Additionally we will be providing a range of online tools and calculators to assist in implementation of SEPT-X™ to your application.

2-Key Value Drivers/Benefits from using BIOSTRAINZ™

This section provides an outline of the value drivers that can be realized from the introduction of SEPT-X™ into wastewater treatment applications. The benefits are dependent on the type of wastewater treatment process.



2.2 Reduced operating expenses

2.2.1 Reduction in sludge haulage and disposal

2.2.2 Energy cost savings

2.2.3 Reduction in chemical additive costs

2.2.4 Increase longevity of treatment plant equipment

2.3 Reduction in odor

2.4 Increased capacity/capital avoidance

2.5 Increased process stability

2.6 Potential to reduce classification of sludge waste

2.7 Suitable for all Biological treatment plants

2.8 No bolt on technology/capital costs required for implementation

2.9 Reduction in strength of effluent in a wastewater treatment process.

2.1 Reduced operating expenses

2.1.1 Reduction in sludge haulage and disposal

One of the key benefits of the introduction of SEPT-X™ will be the significant reduction in sludge biomass. The reduction can be up to 85%, which will result in significant savings in sludge haulage and disposal fees. Secondary cost savings can occur in reduced labor and capital costs required for residual sludge handling.

Money Isn't All You're Saving

2.1.2 Energy cost savings

SEPT-X™ has the ability to lower required effluent detention times and in some applications the need for mechanical agitation. This can result in lower energy costs in treating the influent. Quantifiable energy savings from lower demands on equipment per unit of influent and/or being able to switch off equipment altogether can be realized.

2.1.3 Reduction in chemical additive costs

Chemical additives, such as flocculants, can be reduced due to the lesser biomass contained in the sludge resulting in direct savings in chemical costs. SEPT-X™ also has antifungal properties lessening the dosing volumes of potential disinfectants resulting in additional savings. The reduction of chemical use will also create an additional benefit to operators as they will handle less of these chemicals.

2.1.4 Increased longevity of treatment plant equipment

Addition of SEPT-X™ can reduce strain on equipment from handling higher sludge volumes. SEPT-X™ will also reduce hydrogen sulfide by up to 17% increasing longevity of plant equipment. This should translate to lower maintenance costs of treatment plant equipment.

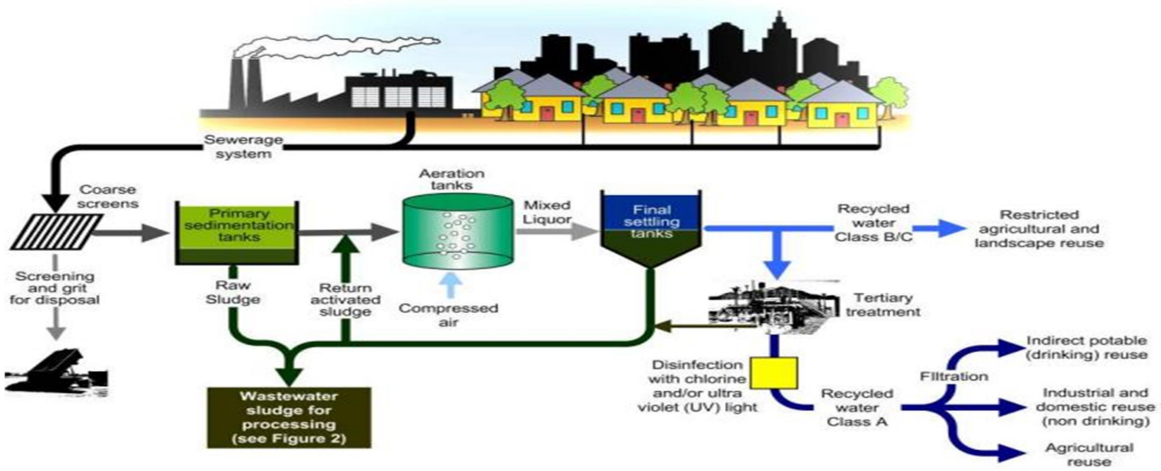
2.2 Reduction in odor

SEPT-X™ has the added benefit of reducing odors emitted from wastewater treatment applications. This is a significant benefit when residential housing encroaches upon treatment facilities. Improvement in odor emission can have a positive impact resulting in less complaints from the community and less public pressure on wastewater treatment plant owners and professionals.

2.3 Increased capacity/capital avoidance

The addition of SEPT-X™ will result in increased plant capacity due to lower biomass in the process, as well as decreased contact time. This will enable higher volumes of wastewater to be treated with the same equipment, resulting in capital avoidance.

2.4 Increased process stability



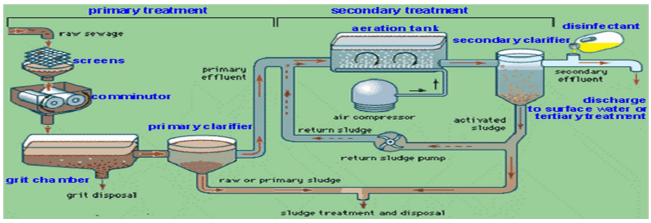
SEPT-X™ may assist in increasing plant stability as there is less reliance on maintaining a biomass. The result is less time must to be spent on monitoring and tweaking plants to retain stability.

2.5 Potential to reduce classification of sludge waste

In some instances the efficiency of SEPT-X™ technology will remove a significant amount of pathogens and volatile organic content from sludge waste. This may result in the reclassification of waste products to less hazardous criteria. This may make sludge waste suitable for salable commercial applications rather than waste disposal.

2.6 Suitable for all Biological treatment plants

SEPT-X™ is a natural product that lends itself to biological treatment processes and hence there are no special requirements for the addition of SEPT-X™ to a biological treatment plant.



2.7 No bolt on technology/capital costs required for implementation

SEPT-X™ is simple to dose on an ongoing process and can be done manually or by a relatively simple batching process. The result is there are no capital implementation costs associated with implementation.

2.8 Reduction in strength of effluent

The efficiency of SEPT-X™ will significantly reduce BOD, COD, SS, TKN, and turbidity loadings in effluents. This will help effluent to meet waste treatment licensing requirements.

3 Introducing SEPT-X™ to a Wastewater Treatment Process

SEPT-X™ has a broad range of applications across all segments of commercial, industrial and agricultural wastewater management. The following section is a guide to selecting the most effective dosing protocol by application.

The applications are sorted by complexity of the treatment process. There are different protocols for dosing SEPT-X™ which is dependent on complexity, type of treatment process and objective of treatment process. The respective dosing protocol is listed against the application type for easy selection.

When the suitable dosing protocol is selected, detailed information on the specific dosing program may be found in Section 4: Dosing Programs. Each specific dosing protocol will cover key objectives and expected outcomes, as well as guidance on measuring performance with data collection and analysis.

3.1 Basic type Applications

SEPT-X™ is effective in enhancing the performance of all types of wastewater effluent storage lagoons, infiltration basins and percolation ponds. The use of **SEPT-X™** in these applications provides an economical alternative to mechanical sludge removal. Improving percolation can increase the capacity of existing lagoons and defer the capital cost of installing additional units. **SEPT-X™** improves the performance of commercial septic systems, often where large volumes have a short period of time for treatment before exiting to a leach field.

Select the suitable dosing protocol from the table below, comprehensive dosing information is detailed in Section 4: **DOSING PROGRAMS**

Application	Dosing Protocol
Effluent Storage Basins (ESBs)	Type 1 Dosing Protocol
Effluent Lagoons (Aerated/Non-Aerated)	
Facultative Lagoons	
Oxidation Pits	
Polishing Ponds	
Rapid Infiltration Basins	Type 2 Dosing Protocol
Percolation Ponds	
Septic Tanks and Sewage Transporting Cars	Type 3 Dosing Protocol
Sludge Drying Beds	Type 4 Dosing Protocol
Decorative Ponds	Type 5 Dosing Protocol
Livestock Manure Lagoons: Dairy and Swine	Type 6 Dosing Protocol
Deep Pits – Hog Production Houses	

3.2 Simple Food processing Applications

SEPT-X™ PLUS is highly effective in grease traps and oil water separators. The product is particularity suited to breaking down mineral and organic types of fats, oils and grease. Use of **SEPT-X™ PLUS** in this application will significantly reduce blockages, improve system capacity and remove odor.

Select the suitable dosing protocol from the table below. Comprehensive dosing information is detailed in **DOSING PROGRAMS.**

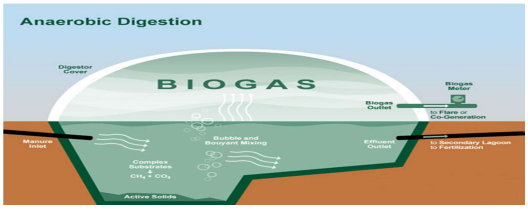
Application	Dosing Protocol
Grease Traps	Type 7 Dosing Protocol
Oil Water Separators	

3.3 Anaerobic Digesters

SEPT-X™ accelerates biological processes in the same direction. Just as it rapidly increases the oxidation of volatile organic solids in aerobic systems, it will also increase the rate of methanogenesis in an anaerobic environment. Biogas production increases significantly, resulting in a higher methane content and less hydrogen sulfide. **Dosing Type 8 Protocol.**

3.4 Wastewater Treatment

SEPT-X™ is highly effective in enhancing the performance of all types of wastewater plants. The use of **SEPT-X™** in these applications will show operational cost savings in reduced sludge haulage and disposal, reduced energy costs and improved efficiency leading to capital avoidance.



There are significant variations in the design and equipment used in wastewater treatment plants. SEPT-X™ has experience in treating different types of waste water treatment plants, and a customized dosing program can be generated for these applications. These programs can be developed by SEPT-X™. For programs and further information please contact us at techsupport@SEPT-X.com.

Application	Dosing Protocol
Package Plants	Custom Program
Return Activated Sludge	Custom Program
Sequencing Batch Reactor	Custom Program
Membrane Technology	Custom Program

3.5 Industrial Wastewater Treatment

There is draft of benefits from addition of **SEPT-X™** to industrial wastewater treatment processes.

There are significant variations in the design and equipment used in industrial wastewater treatment plants. Additionally, the type of effluent can vary substantially. Due to the varied nature of plant types and effluent, a customized doing program should be developed for these applications. SEPT-X™ has experience in treating different types of waste water treatment plants, and a customized dosing program should be considered for these applications. These programs can be developed by SEPT-X™. For programs and further information please contact us at techsupport@SEPTX.com.

Application (type of effluent)	Dosing Protocol
Manufacturing Type	Custom Program
Chemical	Custom Program
Food and Beverage	Custom Program
Livestock Production and Wastewater	Custom Program

3.6 Other types of wastewater treatment plants

SEPT-X™ works across a range of wastewater treatment plants and applications. If specific wastewater treatment plants are not addressed in this manual, for assistance on proper dosing programs or a customized dosing program please contact us at techsupport@SEPTX.com.

4 Dosing Programs

4.1 Type 1 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for:

- Effluent Storage Basins (ESBs)
- Effluent Storage Lagoons
- Oxidation Pits
- Facultative Lagoons
- Polishing Ponds

Key Objectives

- Solids/sludge reduction to increase system capacity and reduce sludge haulage and disposal costs
- Odor reduction lessens impact on surrounding community
- Reduced effluent strength lessens impact on environment

System Information

This facility information is important in developing an effective application of SEPT-X™:

- **Volume** – Volume of the lagoon, storage basin, holding cell, etc.
- **Daily Inflow** – The approximate measured or estimated daily inflow to the cell, including additions from precipitation or groundwater seepage.
- **Design** – The overall design of the lagoon system, including the lining of the cell, mechanical mixing or aerating, flow-through to other cells, etc.
- **Wastewater Source** – The type of facility and characteristics of the wastewater effluent, particularly fat/oil/grease content.

Recommended product for dosing

If the fat/oil/grease content is below 200mg/L, then **SEPT-X™** is recommended. Where fat/oil/grease content is in excess of this level, **SEPT-X™ PLUS** should be used.

Prescription

Introduction

The use of SEPT-X™- or SEPT-X™ PLUS in a lagoon, pond or other type of wastewater holding cell should begin with a series of relatively high "shock" doses designed to quickly bring about a large amount of enzyme activity. This can be thought of as a rehabilitation phase with the goal of clearing accumulated organic solids from the system. We usually recommend that shock doses be applied ***weekly*** for the first 3 or 4 weeks, with the dose incrementally stepped down. For ponds with a very high daily inflow relative to the total pond volume, it is more effective to apply a series of ***daily*** shock doses for the first 3 or 4 days.

After three or four consecutive shock doses either daily or weekly, it is effective to continue to apply a monthly or periodic shock dose until organic solids are effectively cleared from the pond. It may be useful to administer follow-up shock doses as needed, for example, when weather conditions change significantly, or when the effluent feeding the pond has a sudden spike in flow volume or volatile characteristics. A shock dose can remain active and effective for several weeks where conditions are optimal for SEPT-X™—that is, where temperatures and precipitation are moderate and inflow is relatively low. The dose indicated for a specific pond can vary considerably—the most important variables are pond volume, daily flow volume, temperature and general climactic conditions, the quantity of built up solids in the system, and individual variances in the biochemical constituency of the pond.

Rehabilitation Phase

Generally, we recommend that the first shock dose be applied at a concentration of approximately 2 milligrams of SEPT-X™ or SEPT-X™ PLUS per liter of pond volume—that is, 2 parts per million. For example, a 2 mg/L dose for a pond of 1,000,000 gallons would be approximately 7.5 kg of SEPT-X™ or SEPT-X™ PLUS. The subsequent two shock doses can be reduced to 1 mg/L. The fourth and any remaining doses may be reduced to 0.5 mg/L.

While beginning shock dose applications on the pond, we recommend that you also begin applying SEPT-X™ daily to the flow of wastewater entering the pond. We generally prescribe a daily dose of approximately 0.5 mg of SEPT-X™ or SEPT-X™ PLUS per liter of daily flow volume. For example, a daily inflow of 50,000 gallons would require a daily dose of approximately 100 g of SEPT-X™ or SEPT-X™ PLUS. This daily dose should be continued indefinitely to continually treat wastewater as it enters the pond. Incorporating both shock doses and daily doses, a typical pond dosing schedule might look as follows:

Pond with low inflow (Retention time (Pond Volume/Inflow)>7):

Day	Shock Dose to pond mg/L	Daily Dose to influent mg/L
	mg of SEPT-X™ / SEPT-X™ PLUS per liter of pond volume	mg of SEPT-X™ / SEPT-X™ PLUS per liter of pond volume
1	2	0.5
2 – 7		0.5
8	1	0.5
9-14		0.5
15	1	0.5
16-21		0.5
22	0.5	0.5
23-30 and ongoing		0.5
31 and monthly, as needed	0.5	0.5

Pond with high inflow (Retention time (Pond Volume/Inflow)<7)

Day	Shock Dose mg/L	Daily Dose mg/L
	mg of SEPT-X™ / SEPT-X™ PLUS per liter of pond volume	mg of SEPT-X™ / SEPT-X™ PLUS per liter of pond volume
1	2	0.5
2	1	0.5
3	1	0.5
4	0.5	0.5
5-30 and ongoing daily		0.5
31 and monthly, as needed	0.5	0.5

Implementation

A) Pre-activation. Follow the basic directions for the proper pre-activation of each dose of SEPT-X™ or SEPT-X™ PLUS.

- Mix the prescribed amount of SEPT-X™ or SEPT-X™ PLUS in fresh water at a concentration of approximately 5,000 mg/L (ppm).
- Leave the container uncovered and exposed to ambient air—or use a mechanical aerator.
- Keep the container in a warm place above 60° F.
- Let the mix activate for 24 hours.
- Stir immediately before applying to re-suspend any settled material in the solution.

B) Application. Apply the pre-activated dose of SEPT-X™ or SEPT-X™ PLUS to the entire surface of the lagoon, pond or other wastewater holding cell. Shock doses for very large lagoons are best applied using some type of pump and spray device, such as a 5,000-gallon tanker with a spray pump. We recommend that you try to distribute the dose as widely as possible across the lagoon surface.

Many simpler methods work well for applying shock doses to smaller lagoons. A submersible pump with an attached hose works well.

Place the pump into the container of pre-activated SEPT-X™ or SEPT-X™ PLUS and pump the dose through the hose over the lagoon surface. Manually tossing the pre-activated dose from buckets out across the lagoon surface is also effective. In any case, apply the dose in such a way that it is well distributed across the surface. This will help maximize the widespread and immediate action of SEPT-X™ or SEPT-X™ PLUS on the substrate.

Performance Data Collection

The collection of data is critical to tracking the progress of SEPT-X™ or SEPT-X™ PLUS in meeting the key objectives. We recommend that before implementing a program of dosing with SEPT-X™ or SEPT-X™ PLUS, you first establish a thorough baseline by measuring as many performance parameters as are applicable to your wastewater system. The following is an example of a performance data collection program, beginning with baseline data and then tracked at regular intervals throughout the dosing program.

Data	Frequency				
	Baseline	Weekly	30 days	60 days	90 days
Average Daily Inflow (measured or estimated)	X	X			
Fat/Grease/Oil Content					
Pond Temperature	X	X			
Precipitation	X	X			
Sludge Depth	X		X	X	X
Log of Subjective Observations— odor, water clarity, bubbling activity	X	X			
Water Quality Analysis BOD, COD, TKN, TSS, Turbidity	X		X	X	X

Type 2 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for:

- Rapid Infiltration Basins
- Percolation Ponds

Key Objectives

- Improved percolation/infiltration resulting in better treatment of influent
- Increased cell capacity reducing need for additional facilities
- Odor reduction lessens impact on surrounding community
- Reduced effluent strength lessens impact on environment

System Information

This facility information is important in developing an effective application of SEPT-X™:

- **Volume** – The current volume of the basin or pond, extra the total capacity.
- **Daily Inflow** – The approximate measured or estimated daily inflow to the basin or pond, including additions from precipitation or groundwater seepage.
- **Design** – The overall design of the basin or pond.
- **Sludge volume** – Calculate the volume using the average depth or thickness of the accumulated bottom sludge layer.

Recommended product for application

SEPT-X™ should be used for this application.

Prescription

Introduction

The use of SEPT-X™ in a basin or pond designed for the percolation of effluent wastewater should begin with a series of "shock" doses to quickly bring about a large amount of catabolic activity in the sludge layer. The first objective is to digest the organic solids throughout the bottom of the cell to allow for faster and more complete downward infiltration of effluent.

We usually recommend that shock doses be applied ***weekly*** for the first 3 or 4 weeks, with the dose incrementally decreased. For ponds with a very high daily inflow relative to the total pond volume, it is more effective to apply a series of ***daily*** shock doses for the first 3 or 4 days.

After three or four consecutive shock doses either daily or weekly, it is effective to continue to apply a monthly or periodic shock dose until organic solids are effectively cleared from the pond. It may be useful to administer follow-up shock doses as needed, for example, when weather conditions change significantly, or when the effluent feeding the pond has a sudden spike in flow volume or volatile characteristics. A shock dose can remain active and effective for several weeks where conditions are optimal for SEPT-X™—that is, where temperatures and precipitation are moderate and inflow is relatively low.

The dose indicated for a specific pond can vary considerably—the most important variables are pond volume, daily flow volume, temperature and general climactic conditions, the quantity of built up solids in the system, and individual variances in the biochemical constituency of the pond.

Rehabilitation Phase

Generally, we recommend that the first shock dose be applied at a concentration of approximately 2 milligrams of SEPT-X™ per liter of pond volume—that is, 2 parts per million. For example, a 2 mg/L dose for a pond of 1,000,000 gallons would be approximately 7.5 kg of SEPT-X™. The subsequent two shock doses can be reduced to 1 mg/L. The fourth and any remaining doses could be reduced to 0.5 mg/L.

When beginning shock dose applications on the pond, we recommend that you also begin applying SEPT-X™ daily to the flow of wastewater entering the pond. We generally prescribe a daily dose of approximately 0.5 mg of SEPT-X™ per liter of daily flow volume. For example, a daily inflow of 50,000 gallons would require a daily dose of approximately 100 g of SEPT-X™. This daily dose should be continued indefinitely to continually treat wastewater as it enters the pond. After shock doses are discontinued, the daily dose to the inflow alone will serve to constantly replenish SEPT-X™ in the pond.

Incorporating shock doses and daily doses, a typical pond dosing schedule might look as follows:

Pond with low inflow (Retention time (Pond Volume/Inflow)>7):

Day	Shock Dose to pond mg/L mg of SEPT-X™ / SEPT-X™ PLUS per liter of pond volume	Daily Dose to influent mg/L mg of SEPT-X™ / SEPT-X™ PLUS per liter of pond volume
1	2	0.5
2 – 7		0.5
8	1	0.5
9-14		0.5
15	1	0.5
16-21		0.5
22	0.5	0.5
23-30 and ongoing		0.5
31 and monthly, as needed	0.5	0.5

Pond with high inflow (Retention time (Pond Volume/Inflow)<7)

Day	Shock Dose mg/L mg of SEPT-X™ / SEPT-X™ extrra per liter of pond volume	Daily Dose mg/L mg of SEPT-X™ / SEPT-X™ PLUS per liter of pond volume
1	2	0.5
2	1	0.5
3	1	0.5
4	0.5	0.5
5-30 and ongoing daily		0.5
31 and monthly, as needed	0.5	0.5

Implementation

C) Pre-activation. Follow the basic directions for the proper pre-activation of each dose of SEPT-X™.

- Mix the prescribed amount of SEPT-X™ in fresh water at a concentration of approximately 5,000 mg/L (PPM).
- Leave the container uncovered and exposed to ambient air, or use a mechanical aerator.
- Keep the container in a warm place above 60° F.
- Let the mix activate for 24 hours.
- Stir immediately before applying to re-suspend any settled material in the solution.

D) Application. Apply the pre-activated dose of SEPT-X™ to the entire surface of the pond or basin. Shock doses for very large ponds are best applied using some type of pump and spray device, such as a 5,000-gallon tanker with a spray pump. We recommend that you try to distribute the dose as widely as possible across the pond surface.

Several simpler methods work well for applying shock doses to smaller ponds. A submersible pump with an attached hose works well: place the pump into the container of pre-activated SEPT-X™ and pump the dose through the hose over the pond surface. Manually tossing the pre-activated dose from buckets out across the pond surface is also effective. In any case, apply the dose in such a way that it is well distributed across the surface. This will help maximize the widespread and immediate action of SEPT-X™ on the substrate.

Performance Data Collection

The collection of data is critical to tracking the progress of SEPT-X™ in meeting the key objectives. We recommend that before implementing a program of dosing with SEPT-X™, you first establish a thorough baseline by measuring as many performance parameters as are applicable to your wastewater system. The following is an example of a performance data collection program, beginning with baseline data and then tracked at regular intervals throughout the dosing program.

Data	Frequency				
	Baseline	Weekly	30 days	60 days	90 days
Average daily inflow (measured or estimated)	X	X			
Pond temperature	X	X			
Precipitation	X	X			
Sludge depth	X		X	X	X
Log of subjective observations— odor, water clarity, bubbling activity	X	X			
Water quality analysis— BOD, COD, TKN, TSS, Turbidity	X		X	X	X

Type 3 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for:

- Commercial septic tank systems.
- Sewege transporting trucks

Note: for residential type septic tanks, SEPT-X™ has SEPT-X™ H and SEPT-X™ H Rescue which have been specifically designed for these applications. For further details on these products and instructions please refer to our website www.SEPT-X.com.

Key Objectives

- Solids reduction leads to increased capacity of system
- Odor reduction lessens impact on surrounding community
- Improved leach field infiltration
- Reduced effluent strength lessens impact on environment

System Information

These design features are important in developing an effective application of SEPT-X™ to commercial septic tank and leach field systems:

- **Volume** - The volume and number of the septic tanks or tank series, extra any associated pump tanks or lift stations.
- **Flow Rate** - Good calculations or estimates of daily through-put, for determining the system's residence time, therefore the time the product has in contact with solids in the system.
- **Design** - Features such as baffle walls, grit chambers, system pressurization, influent or effluent pumps or lift stations. The accessibility of the tanks: is it possible to open tank lids for product application, measuring solids and observing changes?
- **Leach Field** - The size and design specifications on the leach field system, as well as the condition of the soil can indicate varying approaches to applying SEPT-X™—frequency, concentration, and duration of time required to affect results.

Recommended product for application

SEPT-X™ PLUS should be used for this application.

Prescription

Introduction

SEPT-X™ PLUS is useful both in rehabilitating failing systems and maintaining systems in optimal health. To rehabilitate a failing or underperforming system, the product should be applied at a higher dose and application frequency. Additionally, the residence time should be considered. For tanks with a high flow-through rate (short residence time), product application should be made more frequently so that SEPT-X™ PLUS remains active and in contact with the tank solids.

It is also useful to coordinate the timing of SEPT-X™ PLUS application with predictable fluctuations in system flow-through. The product should be applied at the start of a period of relatively low flow, such as on a Monday, or following a holiday. If the product is applied at the start of a high flow period, it will more quickly wash through the tank and spend less time in contact with tank solids. With sufficient contact time of several days to weeks, the product will prove very effective at breaking down organic solids and pre-empting odors.

Rehabilitation

When a system is failing or underperforming, a dose of 100g (one package) per 2500 gallons tank volume should be applied. This should be applied monthly at a minimum, bi weekly for systems with high flow.

Sample rehabilitation regimens using SEPT-X™ PLUS:

Tank with low inflow (Retention time (Septic tank/Inflow)>30):

Septic Tank Size	SEPT-X™ PLUS	Dose Frequency
1,000 gal	100 g	Monthly
2,500 gal	100 g	Monthly
8,000 gal	400 g	Monthly

Tank with high inflow (Retention time (Septic tank/Inflow)<30):

Septic Tank Size	SEPT-X™ PLUS	Dose Frequency
1,000 gal	100 g	Bi-weekly
2,500 gal	100 g	Bi-weekly
8,000 gal	400 g	Bi-weekly

Maintenance

Once systems are running more optimally, for ongoing maintenance application we recommend a dose of 100 grams per 5,000 gallons of tank volume, applied quarterly. For systems with high flow-through, a monthly application is still optimal for ongoing maintenance. Sample maintenance regimen using SEPT-X™ PLUS:

Tank with low inflow (Retention time (Septic tank/Inflow)>30):

Septic Tank Size	SEPT-X™ PLUS	Dose Frequency
1,000 gal	100 g	Quarterly
2,500 gal	100 g	Quarterly
8,000 gal	400 g	Quarterly

Tank with high inflow (Retention time (Septic tank/Inflow)<30):

Septic Tank Size	SEPT-X™ PLUS	Dose Frequency
1,000 gal	100 g	Monthly
2,500 gal	100 g	Monthly
8,000 gal	400 g	Monthly

Implementation

A. **Pre-activation.** Follow the basic directions for the proper pre-activation of each dose of SEPT-X™ PLUS.
- Mix the prescribed amount of SEPT-X™ PLUS in fresh water at a concentration of approximately 5,000 mg/L (PPM).
- Leave the container uncovered or use a mechanical aerator.
- Keep the container in a warm place above 60° F.
- Let the mix activate for 24 hours.
- Stir and then apply the dose to the septic tank through the lid, a toilet or a pipe cleanout.

B. Application. Apply the pre-activated dose of SEPT-X™ PLUS to the septic tank through the lid, a toilet or a pipe cleanout. If prepared dose is poured into toile to drain ensure toilet is flushed or drain is washed down with water to ensure dose is reaches treatment area.

Performance Data Collection

These data are useful for measuring the progress of SEPT-X™ PLUS in reducing solids and improving effluent water quality. For these purposes, we recommend collecting samples of effluent liquid from the final tank chamber or an effluent pump tank, if applicable. First collect samples and take sludge measurements to establish a baseline. Then, measurements and samples should be collected at regular intervals to track the progress of system rehabilitation over time.

Data	Collected				
	Baseline	Weekly	30 days	60 days	90 days
Fats, Oils & Greases (PLUS)	X		X	X	X
Log of subjective observations— odor, water clarity, bubbling activity	X	X			
Sludge levels – measurements of floating and bottom sludges	X	X			
Nitrates/Nitrites/Total Nitrogen (TKN)	X		X	X	X
Biochemical Oxygen Demand (BOD)	X		X	X	X
Total Suspended Solids (TSS)	X		X	X	X

Type 4 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for:

- Sludge Drying Beds

Key Objectives

- Solids reduction leads to increased capacity of system
- Odor reduction lessens impact on surrounding community

System Information

This facility information is important in developing an effective application of SEPT-X™:

- **Volume** – The current volume of the sludge wasting bed, including both solids and liquids, Extra the total capacity.
- **Sludge Wasting Schedule** – The approximate amount and frequency of wasting events.

Recommended product for application

SEPT-X™ should be used for this application.

Prescription

We recommend a consistent application of SEPT-X™ to a sludge drying bed at a dose concentration of between 10 and 20 mg/L. This dose should be applied at least as frequently as sludge is wasted. At a minimum, apply SEPT-X™ weekly. If sludge wasting events occur less than once per month, simply apply SEPT-X™ to the sludge drying bed immediately prior to or DURING sludge wasting.

Implementation

E) Pre-activation. Follow the basic directions for the proper pre-activation of each dose of SEPT-X™.

- Mix the prescribed amount of SEPT-X™ in fresh water at a concentration of approximately 5,000 mg/L (ppm).
- Leave the container uncovered and exposed to ambient air, or use a mechanical aerator.
- Keep the container in a warm place above 60° F.
- Let the mix activate for 24 hours.
- Stir immediately before applying to re-suspend any settled material in the solution.

F) Application. Apply the pre-activated dose of SEPT-X™ to the entire surface of the sludge drying bed. Shock doses for very large ponds are best applied using some type of pump and spray device, such as a 5,000-gallon tanker with a spray pump. We recommend that you try to distribute the dose as widely as possible across the pond surface. Several simpler methods work well for applying shock doses to smaller ponds. A submersible pump with an attached hose works well: place the pump into the container of pre-activated SEPT-X™ and pump the dose through the hose over the pond surface. Manually tossing the pre-activated dose from buckets out across the pond surface is also effective. In any case, apply the dose in such a way that it is well distributed across the surface. This will help maximize the widespread and immediate action of SEPT-X™ on the substrate.

Performance Data Collection

The collection of data is critical to tracking the progress of SEPT-X™ in meeting the key objectives. We recommend that before implementing a program of dosing with SEPT-X™ you first establish a thorough baseline by measuring as many performance parameters as are applicable to your wastewater system. The following is an example of a performance data collection program, beginning with baseline data and then tracked at regular intervals throughout the dosing program.

Data	Frequency				
	Baseline	Weekly	30 days	60 days	90 days
Sludge volume, volume wasted	X	X			
Sludge depth	X		X	X	X
Log of subjective observations— odor, water clarity, bubbling activity	X	X			
Water quality analysis— BOD COD, TKN, TSS, Turbidity	X		X	X	X

Type 5 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for;

- Decorative Ponds

Key Objectives

- Organic Sludge reduction leads to increased capacity of system
- Odor reduction lessens impact on surrounding community
- Improved overall water quality – color and clarity lessens impact on environment

Background Information

This facility information is important in developing an effective application of SEPT-X™:

- **Volume** – The current volume of the pond.
- **Design** – The overall design of the pond, including details such as the lining, type and number of pumps, mechanical aerating devices, etc.
- **Existing biological or chemical treatments** – algaecides, fungicides, coloring agents, etc.

Recommended product for application

SEPT-X™ should be used for this application.

Prescription

Introduction

The use of SEPT-X™ in a decorative pond should begin with a series of “shock” doses designed to quickly bring about a large amount of catabolic activity. Once the shock or rehabilitation doses are complete a maintenance program should be adopted.

Rehabilitation

We recommend that shock doses be applied weekly for four consecutive weeks, with doses decreasing incrementally, as follows:

Schedule	SEPT-X™ /Liter of pond volume
Week 1	2 mg/L
Week 2	1 mg/L
Week 3	1 mg/L
Week 4	0.5 mg/L
Monthly (as needed)	0.5 mg/L

Continue applying a dose of 0.5 mg/L until you achieve the desired objectives.

Maintenance

Once you have a cleaner, odor-free pond, we recommend a maintenance program of monthly applications of SEPT-X™ at 0.2 mg/L. If pond conditions begin to deteriorate again, such as due to mechanical maintenance or changes in weather or use, re-apply shock doses periodically as needed, at a dose of 1 mg/L.

Implementation

A) Pre-activation. Follow the basic directions for the proper pre-activation of each dose of SEPT-X™

B) Application. Apply the pre-activated dose of SEPT-X™ to the entire surface of the pond. For larger ponds, doses are best applied using some type of pump and spray device. Many simpler application methods work well for smaller ponds. A submersible pump with an attached hose works well: place the pump into the container of pre-activated SEPT-X™ and pump the dose through the hose over the pond surface. Manually tossing the pre-activated dose from buckets out across the pond surface is also effective. In any case, apply the dose in such a way that it is well distributed across the surface. This will help maximize the widespread and immediate action of SEPT-X™ on the substrate.

Performance Data Collection

The collection of data is critical to measuring the progress of SEPT-X™ in meeting the key objectives. We recommend that before implementing a program of dosing with SEPT-X™ you first establish a thorough baseline by measuring as many performance parameters as are applicable to your wastewater system. The following is an example of a performance data collection program, beginning with baseline data and then tracked at regular intervals throughout the dosing program.

Data	Frequency				
	Baseline	Weekly	30 days	60 days	90 days
Sludge level	X	X			
Log of subjective observations— odor, water clarity, bubbling activity	X	X			
Water quality analysis— BOD, COD, TKN, TSS, Turbidity	X		X	X	X

Type 6 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for:

- Livestock Manure Lagoons
- Deep Pits / Swine Production Houses

Key Objectives

- Solids reduction leads to increased system capacity
- Odor reduction lessens impact on surrounding community
- Reduced effluent strength lessens impact on environment

System Information

This facility information is important in developing an effective application of SEPT-X:

- **Volume** – Volume of the lagoon, storage basin, holding cell, etc.
- **Daily Inflow** – The approximate measured or estimated daily inflow to the cell, including additions from precipitation or groundwater seepage.
- **Design** – The overall design of the lagoon system, including details such as the lining of the cell, mechanical mixing or aerating, flow-through to other cells, etc.
- **Wastewater Source** – The type of facility and characteristics of the wastewater effluent.

Recommended product for application

FARM360 should be used for this application.

Prescription

Introduction

The use of FARM360 in a lagoon, pond or other type of wastewater holding cell should begin with a series of relatively high "shock" doses designed to quickly bring about a large amount of enzyme activity. This can be thought of as a rehabilitation phase with the goal of clearing accumulated organic solids from the system.

We usually recommend that shock doses be applied ***weekly*** for the first 3 or 4 weeks, with the dose incrementally stepped down. For ponds with a very high daily inflow relative to the total pond volume, it is more effective to apply a series of ***daily*** shock doses for the first 3 or 4 days.

After three or four consecutive shock doses either daily or weekly, it is effective to continue to apply a monthly or periodic shock dose until organic solids are effectively cleared from the pond. It may be useful to administer follow-up shock doses as needed, for example, when weather conditions change significantly, or when the effluent feeding the pond has a sudden spike in flow volume or volatile characteristics. A shock dose can remain active and effective for several weeks where conditions are optimal for SEPT-X™ Clean (Beef & Dairy) —that is, where temperatures and precipitation are moderate and inflow is relatively low.

The dose indicated for a specific pond can vary considerably. The most important variables are pond volume, daily flow volume, temperature and general climactic conditions, the quantity of built up solids in the system, and individual variances in the biochemical constituency of the pond.

Rehabilitation

Generally, we recommend that the first shock dose be applied at a concentration of approximately 2 milligrams of FARM360 per liter of pond volume—that is, 2 parts per million. For example, a 2 mg/L dose for a pond of 1,000,000 gallons would be approximately 7.5 kg of FARM360. The subsequent two shock doses can be reduced to 1 mg/L. The fourth and any remaining doses could be reduced to 0.5 mg/L.

While beginning shock dose applications on the pond, we recommend that you also begin applying FARM360 to the flow of wastewater entering the pond. We generally prescribe a daily dose of approximately 0.5 mg of FARM360 per liter of daily flow volume. For example, a daily inflow of 50,000 gallons would require a daily dose of approximately 100 g of FARM360. This daily dose should be continued indefinitely to continually treat wastewater as it enters the pond.

Incorporating shock doses and daily doses, a typical pond dosing schedule might look as follows:

Pond with low inflow (Retention time (Pond Volume/Inflow)>7):

Day	Shock Dose to pond mg/L	Daily Dose to influent mg/L
	mg of FARM360 per liter of pond volume	mg of FARM360 per liter of daily inflow volume
1	2	0.5
2 – 7		0.5
8	1	0.5
9-14		0.5
15	1	0.5
16-21		0.5
22	0.5	0.5
23-30 and ongoing daily		0.5
31 and monthly, as needed	0.5	0.5

Pond with high inflow (Retention time (Pond Volume/Inflow)<7):

Day	Shock Dose mg/L	Daily Dose mg/L
	mg of FARM360 per liter of pond volume	mg of FARM360 per liter of daily inflow volume
1	2	0.5
2	1	0.5
3	1	0.5
4	0.5	0.5
5-30 and ongoing daily		0.5
31 and monthly, as needed	0.5	0.5

Maintenance

After shock doses are discontinued, the daily dose of 0.5mg/L alone will serve to constantly replenish the SEPT-X™ enzymes in the pond.

Implementation

A) Pre-activation. Follow the basic directions for the proper pre-activation of each dose of FARM360.

- Mix the prescribed amount of FARM360 in fresh water at a concentration of approximately 5,000 mg/L (ppm).
- Leave the container uncovered and exposed to ambient air, or use a mechanical aerator.
- Keep the container in a warm place above 60° F.
- Let the mix activate for 24 hours.
- Stir immediately before applying to re-suspend any settled material in the solution.

B) Application. Apply the pre-activated dose of FARM360 to the entire surface of the lagoon, pond or other wastewater holding cell. Shock doses for very large lagoons are best applied using some type of pump and spray device, such as a 5,000-gallon tanker with a spray pump. We recommend that you try to distribute the dose as widely as possible across the lagoon surface.

Several simpler methods work well for applying shock doses to smaller lagoons. A submersible pump with an attached hose works well by placing the pump into the container of pre-activated FARM360 and pumping the dose through the hose over the lagoon surface. Manually tossing the pre-activated dose from buckets out across the lagoon surface is also effective. In any case, apply the dose in such a way that it is well distributed across the surface. This will help maximize the widespread and immediate action of FARM360 on the substrate.

Performance Data Collection

The collection of data is critical to tracking the progress of FARM360 in meeting the key objectives. We recommend that before implementing a program of dosing with FARM360 you first establish a thorough baseline by measuring as many performance parameters as are applicable to your wastewater system. The following is an example of a performance data collection program, beginning with baseline data and then tracked at regular intervals throughout the dosing program.

Data	Frequency				
	Baseline	Weekly	30 days	60 days	90 days
Average daily inflow (measured or estimated)	X	X			
Pond temperature	X	X			
Precipitation	X	X			
Sludge depth	X		X	X	X
Log of subjective observations— odor, water clarity, bubbling activity	X	X			
Water quality analysis— BOD, COD, TKN, TSS, Turbidity	X		X	X	X

Type 7 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for:

- Grease traps
- Oil water separators

Key Objectives

- Reduction of fats, oils and greases to save pump-out costs
- Odor reduction lessens impact on surrounding community
- Reduced effluent strength lessens impact on environment

System Information

- **Volume** – Total capacity of the trap or separator.
- **Daily Flow** – Calculate or estimate the average and peak daily volume of wastewater into and out of the unit.
- **Wastewater Source** – Restaurant, food processing, automotive repair, industrial process, etc.
- **Retention Time** – Volume divided by Daily Flow.

Recommended product for application

SEPT-X™ PLUS should be used for this application.

Prescription

A) **Dose**. We generally recommend a dose of one 100g bag of SEPT-X™ PLUS per 1,000 gallons of grease trap or oil/water separator capacity.

B) **Frequency**. A prescription of the frequency of dosing requires a good estimate of the retention or residence time (capacity of unit/Inflow volume) of the grease trap or separator. In order for it to be effective, SEPT-X™ PLUS must remain in the system and in contact with the fats, oils and greases. Therefore, the frequency of dosing must meet or exceed the residence time.

C) The rules of thumb on dosing frequency are as follows:

- Where residence time is less than 1 day, a *continual* application of SEPT-X™ PLUS should be employed, such as with the use of a feed-in pump.
- If residence time exceeds 30 days, we recommend minimum *monthly* dosing.
- Where residence time is between 1 and 30, frequency of doing equals residence time.

Implementation

A) Pre-activation. Follow the basic directions for the proper pre-activation of each dose of SEPT-X™ PLUS.

B) Application. After activation, the prepared dose can be applied directly to the grease trap or oil/water separator through a lid or access port, or it can be poured down a drain that discharges directly to the unit. If the prepared dose is poured down a drain, wash the drain down with water to ensure the dose reaches the treatment area.

Performance Data Collection

The following is an example of a performance data collection program, beginning with baseline data and then tracked at regular intervals throughout the dosing program.

Data	Frequency				
	Baseline	Weekly	30 days	60 days	90 days
Average daily inflow	X	X			
Average number of pump outs required				X	
Log of subjective odor observations	X	X			
Effluent discharge samples TSS, BOD, COD, TKN	X		X	X	X

Type 8 Dosing Protocol

Introduction

This type of SEPT-X™ Dosing Protocol is suitable for:

- Anaerobic Digesters

Key Objectives

- Increase and optimize the conversion of volatile solids to biogas
- Decrease retention time to optimize digester capacity resulting in capital avoidance to cope with increases in influent
- Reducing hydrogen sulfide to improve the lifespan of surrounding equipment
- Improve effluent water quality to lessen impact on environment

System Information

This facility information is important in developing an effective application of SEPT-X™:

- **Volume** – The overall capacity as well as the capacity of each individual vessel (if applicable)
- **Daily Flow** – Total average volume of input to the digester.
- **Overall Design** – Complete mix, horizontal/vertical plug-flow, covered lagoon, etc.
- **Retention Time** – Hydraulic retention time from influent to effluent
- **Substrate** – Sewage treatment plant sludge, livestock manure, etc.

Recommended product for application

SEPT-X™ should be used for this application.

Prescription

Strategies for treating anaerobic digesters with SEPT-X™ vary considerably with such factors as overall design, volume, retention time, temperature and daily flow of the system. SEPT-X™ treatment will work best in a unit that has a mechanism for the continual mixing of the digester contents. In this respect, complete mix digesters are preferable to plug-flow designs.

In a complete mix type digester, we recommend a program of initially high doses, similar to a “shock” dose approach, with decreasing doses as the biological environment inside the unit reaches a new equilibrium. It is likely to take three full cycles of the digester for this equilibrium to be fully realized. When there is digester mixing, it is effective to administer a shock dose calculated on the total digester volume for an entire hydraulic retention cycle. Once the entire contents of the unit have thus been “dosed” and exposed to SEPT-X™, the dosage may be reduced.

A typical dosing program for a complete mix digester might be as follows:

SCHEDULE of DAILY APPLICATIONS	DOSE
Cycle 1	2 mg SEPT-X™ per liter of digester volume
Cycle 2	0.5 mg SEPT-X™ per liter of daily inflow
Cycle 3 and ongoing daily	0.5 mg SEPT-X™ per liter of daily inflow

When digester mixing is not applicable, such as in most plug-flow type designs, we recommend somewhat higher doses to compensate for the relative lack of distribution of the product throughout the entire medium. The dosing program should still begin with an initial "shock" dose in order to ensure good results while the unit reaches a new equilibrium with enzymatic enhancement. Then, as with a complete mix dosing program, the dose may be stepped down with each of the first three retention cycles.

A typical dosing program for a plug-flow digester might be as follows:

SCHEDULE of DAILY APPLICATIONS	DOSE
Cycle 1	10 mg SEPT-X™ per liter of daily inflow
Cycle 2	5 mg SEPT-X™ per liter of daily inflow
Cycle 3 and ongoing	2 mg SEPT-X™ per liter of daily inflow

Implementation

A) Pre-activation. Follow the basic directions for the proper pre-activation of each dose of SEPT-X™.

- Mix the prescribed amount of SEPT-X™ in fresh water at a concentration of approx. 5,000 mg/L (ppm).
- Leave the container uncovered and exposed to ambient air—or use a mechanical aerator.
- Keep the container in a warm place above 60° F.
- Let the mix activate for 24 hours.
- Stir immediately before applying to re-suspend any settled material in the solution.

B) Application. Apply the pre-activated dose of SEPT-X™ to the anaerobic digester intake. Methods for applying SEPT-X™ to an anaerobic digester will vary widely depending on digester design. Applications to a covered lagoon digester may be applied wherever the product will most quickly and thoroughly be spread throughout the lagoon. Dosing at several inlet points would be advisable. For other designs, any simple method of pouring pre-batched SEPT-X™ into the digester inlet is effective.

Performance Data Collection

The collection of data is critical to tracking the progress of SEPT-X™ in meeting the key objectives. We recommend that before implementing a program of dosing with SEPT-X™, you first establish a thorough baseline by measuring as many performance parameters as are applicable to your anaerobic digester. The following is an example of a performance data collection program, beginning with baseline data and then tracked at regular intervals throughout the dosing program.

Data	Units	Frequency
Total inflow	Gallons	Daily
Total solids in and out of the digester	Pounds	Daily
Average digester temperature	°F	Daily
Volatile solids in and out of the digester	%	Baseline and weekly
Total biogas production	SCF	Daily
Biogas composition – CH_4, CO_2, H_2S	% of total	Daily to Weekly
Water quality analysis— BOD, COD, TKN, TSS, Turbidity		Weekly

SEPT-X®

5-MSDS

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standards must be
consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

SECTION I :IDENTIFICATION OF THE MATERIAL AND SUPPLIER:

Blank spaces are not permitted. If any items are not applicable, or no information is available, the space must be marked to indicate that.

Product Name: **SEPT-X**

Pack Size/Container Type:

5gm	**Encapsulated Bag**
100gm	**Vacuum Sealed Foil Bag**
1kg	**Vacuum Sealed Foil Bag**
5kg	**Plastic Bucket**
10kg	**Plastic Bucket**
20kg	**Box**

Recommended Use:

Odor control, waste treatment, waste water treatment

Company: **BIO NATURAL AMERICA INSTITUTE**

Address: **104 W, 4th St., Suite 212**
Royal Oak, MI 48067

Telephone Number: **248 246 2121**

Fax Number: **248 246 2121**

Emergency Telephone Number: **+13134347035**

Section II: - Hazardous Ingredients/Identity Information:

Hazardous Components		
Specific Chemical Identity Common Name(s)	**OSHA PEL**	Not Listed
The material contains no known hazardous constituents.	**ACGIH TLV**	Not Listed

Oral Toxicity	**Rat Oral LD 50**	>21000 mg/kg	**Dermal Toxicity:**	None known
	Fish Oral LD 50	>21000 mg/kg	**Inhalation Toxicity:**	None known

Section III: - Physical/Chemical Characteristics:

Boiling Point:	N/A Solid	**Specific Gravity (H2O = 1)**	1.26
Vapor Pressure (mm Hg.) at 20°C	NT	**Melting Point:**	NT
Vapor Density (AIR = 1)	NT	**Evaporation Rate (Butyl Acetate = 1)**	NT

Solubility in Water:

Partially soluble in water.

Appearance and Odor:

Fine, tan powder with a mild, sweet odor.

Section IV: - Fire and Explosion Hazard Data:

Flash Point (Method Used)	>400°F	**Flammable Limits:** NT	**Flammable Limits:** NT	**UEL:** NT

Extinguishing Media: CO_2, water, or foam.

Special Fire Fighting Procedures: No special firefighting procedures - if large quantities of material do ignite, the material may smolder and need monitoring of fire scene.

Unusual Fire and Explosion Hazards:

No unusual fire or explosion hazards.

Stability: Stable	**Conditions to Avoid:** No known conditions.
HazardousPolymerization: Will Not Occur	**Conditions to Avoid:** No known conditions.

Incompatibility (Materials to Avoid): Non reactive to water, acid, and bases.

Hazardous Decomposition or By-Products:

No uniquely hazardous decomposition products are expected. If the product is burned, as with any nitrogen containing organic material, oxides or nitrogen, carbon dioxide, and water can be produced. Partial combustion may produce, in addition to the above, soot and various oxides of carbon.

Section VI: - Health Hazard Data:

Signs and Symptoms of Exposure:

No specific conditions, if allergic, could show symptoms of watery eyes and skin irritation.

Swallowed: Not harmful in minor quantities, if large volumes are swallowed induce vomiting and seek medical advice

Eye contact: Flush eyes with low pressure water for up to fifteen minutes and if irritation persists, seek medical advice.

Skin contact: Negligible risk, chronic exposure thoroughly wash with soap and water

Inhalation: No known risks, however inhalation of dust should always be minimized

Health Hazardous (Acute and Chronic)

No known health hazards. It is possible for prolonged exposure to cause hypersensitivity in some individuals.

Inhalation of dust can cause coughing, sneezing, or respiratory irritations

Carcinogenicity: NTP No **IARC Monographs:** Not Listed **OSHA Regulated:** No

Medical Conditions:

No known medical conditions. Avoid prolonged exposure.

Emergency and First Aid Procedures:

In case of eye or skin contact, flush with water. Contact physician

In case of inhalation, provide fresh air (oxygen). Contact physician.

In case of ingestion, contact Poison Control Center. Induce vomiting by taking ipecac or large volumes of water.

Section VII: - Precautions for Safe Handling and Use:

Steps to be Taken in Case Material is released or spilled:

Material can be scooped into a dumpster.

Waste Disposal Method:

Can be land applied or placed in a MSW registered landfill or used as a soil amendment. Follow all federal, state, and local regulations.

Precautions to Be Taken in Handling and Storing:

No special precautions. Avoid formation of dust. Avoid excessive storage temperatures and direct sunlight.

Store below 65°C at all times to maintain product effectiveness. Store in a cool, dry location out of direct sunlight.

Once opened SEPT-X must be kept dry and in an airtight container to prevent activation. Once in solution.

SEPT-X as an effective life of 24-48 hours in the absence of a food source. Effective life in solution can be extended if solution if stored at < 5 degrees C.

Other Precautions:

No special precautions.

Section VIII: - Control Measures:

Respiratory Protection (Specify Type): If dust is produced, use a particulate air filter mask.

Ventilation:	**Local Exhaust?**		**Special?**	
	Mechanical (General)?	x	**Other?**	

Protective Gloves:

None needed unless allergic and if handling in bulk, a general use glove is recommended.

Incidental contact may not need use of gloves.

Eye Protection:

Always wear protective eyewear.

Other Protective Clothing or Equipment:

No special equipment or clothing required.

Work/Hygienic Practices:

Normal work/hygienic practices. Wash hands before eating or drinking.

Section IX: TRANSPORT INFORMATION

UN Number:	None allocated
UN Proper Shipping Name:	None allocated
Dangerous Goods Class:	None allocated
Subsidiary Risk:	None allocated
Special Precautions for User:	No special transport requirements
Hazchem Code:	None allocated

Section X:REGULATORY INFORMATION

Poison Schedule No:	Not Applicable

Inventory Status : USA, Germany, Turkey, Australia, China, Japan: Y

Section 7

SEPT-X

Business Proposal

Pilot Project No.: DOWWT001

XXXX Sewage Treatment Works - Application of SEPT-X™

Project Partners:

Xxxx Company

Partner	XXXX company
Project	Municipal Sewage Treatment Plant Optimization
Contact	XXXXXX
Location	XXXX Sewage Treatment Plant
Facility Overview	The Sewage Treatment Plant (STP) has a current flow of approximately 105,000 KL per day with a design capacity of 100,000 KL per day. The plant has two operational sections with a recent upgrade of approximately 65,000 KL per day based on an ICEAS (intermittent cycle extended aeration) process and the original plant with a capacity of approximately **35,000 KL** per day. . The demonstration is proposed to be conducted on the **original plant** due to its smaller capacity. The results will be directly applicable to the newer and larger plant. Based on successful results use of SEPT-X may be expanded to the larger tanks.
Advantages of a SEPT-X Enhanced Facility	By implementing the **SEPT-X™** technology into a municipal WWTP, operators can achieve the following: • Reduced biosolid waste volume. • Potential increased plant capacity. • Reduced energy use via aeration reduction. • Improved discharge quality. • Reduced risk of high pollutant unintended discharge ie storm surge. • Improved efficiency of treatment at all stages of the process. • Cost of operating reductions through reduced need for electricity, polymers, flocculants and treatment chemicals. • Improved carbon footprint through energy reduction and transportation of Biosolids.
SEPT-X Technologies Objectives	To demonstrate the capability of SEPT-X™ to improve STP operations and the value proposition for SEPT-X™ into Sewage Treatment Plants based on its costs offsets and improved environmental outcomes.
The SEPT-X™ Technology	The core **SEPT-X™** technology is a powerful microbial consortia with the capability to produce a broad spectrum of hydrolytic enzymes including the proprietary enzyme “Super Catalyze” which acts as a high speed catalyst. This technology rapidly accelerates natural biological degradation processes to the point where odors, pollutants and organic wastes are rapidly removed at the molecular level. The result is a completely non-toxic, environmentally friendly, cost effective

	and organic solution to many of modern day environmental issues. In WWTP operations this bio technology will • Create rapid and complete decomposition. • Reduce the requirement for aeration through a natural rise in dissolved oxygen levels. • Reduce odors. • Reduce pathogens. • Reduce herbicide & pesticide concentrations. • Reduce the amount and volume of bio solid waste produced. • Increase the natural efficiency of activated sludge treatment plants. • Assist in maintaining the balance of the treatment plant processes.
Technology Investment	The **SEPT-X**™ technology is applied as a powder based additive, which is mixed with water and added to the process. There is a minimal capital cost for an automated mixing station, and the solution is then applied through existing plant & equipment. The ongoing cost of the **SEPT-X**™ technology is approximately $25.50 per ML of sewerage processed. This cost is forecast to be offset through direct cost savings in energy use and polymers. Please see attached documents for an overview of the dosing system to be employed for this trial.
Primary Objective	Reduce the energy use of WWTP by utilizing the **SEPT-X**™ technology to lower the requirement for aeration and reduce the Biosolids produced and therefore polymer required.
Secondary Objectives	Improve the efficiency of the facility by using the **SEPT-X**™ technology to: • Reduce the environmental footprint of the facility • Demonstrate improvements in plant stability • Demonstrate potential for capacity increases without additional capital expenditure based on improved plant efficiencies. • Improve the quality of the final discharges
Pilot Program	The pilot program is proposed to take place on the original tanks at the Doha South facility. Preliminary works required to install a simple mixing and dosing station are proposed to take place during 2nd and 3rd of September 2013, and the pilot program would commence on the 3rd or 4th of September 2013. It is proposed that the demonstration run for an initial period of 30 days. Measurement would be progressive to demonstrate improvements over the initial 30 day period. The product utilized and the dosing rates are detailed in the attached document.

	Assistance will be required from the Doha South Sewage Treatment Works in the following areas: **1.** Assistance with labor for installation on 2nd & 3rd Sept, **2.** Implementation of trial based on attached Work Instructions, **3.** Testing, monitoring and reporting for the duration of the trial.
Dosage and Application Rates	Day 1 - 3ppm ie 105kg SEPT-X™ suspended in filter bag in 1000L of water and dosed continuously at 40L per hour over 24 hours into the influent flow of 35ML Day 2 - 2ppm ie 70kg SEPT-X™ suspended in filter bag in 1000L of water and dosed continuously at 40L per hour over 24 hours into the influent flow of 35ML Day 3 - 1ppm ie 35kg SEPT-X™ suspended in filter bag in 1000L of water and dosed continuously at 40L per hour over 24 hours into the influent flow of 35ML Subsequent days - 0.25ppm ie 9kg (rounded from 8.75kg) SEPT-X™ mixed in 1000L of water and dispersed over 24 hours into the influent flow of 35ML
Testing	It would be proposed that the current testing and measuring regime in place at the facility be continued to show the results of the technology application.
Measurement	The project success can be measured by: • Reduction in the production of biosolids (Tons per mega litre of waste water treated) • Reduction in electricity via the reduced need for aeration through monitoring of aerator run time (via automated DO / aeration controls) • Reduction in odor emission via olfactory assessment. • Reduction in Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), TKN(combination of organically bound nitrogen and ammonia in wastewater), P as effluent from the EAT(*Extended Aeration Tank)*. • Reduction in chemical usage. • Discharge quality including coliforms (universally present in large numbers in the faeces of warm-blooded animals. While coliforms are themselves not normally causes of serious illness, they are easy to culture and their presence is used to indicate that other pathogenic organisms of faecal origin may be present) & ammonia prior to UV. • A total carbon footprint reduction for the tank based on electricity and transport saving.

SECTION 8

HOW TO TEST SEPT-X ON LAB SCALE

TEST of SEPT-X for waste water treatment in laboratory

1. **Objective**: to test SEPT-X for waste water in lab, scale.
2. **Source of waste water:**
   - It should be waste water that is of very strong odor and high organic content, as from a restaurant or food industry/factory.
   - The waste water should be comprised of two parts: waste water, sludge (separately is fine). The objective for using sludge is to compare how SEPT-X digests solid sludge. (Sludge can be taken from the bottom of a pond or the bottom of an oil and grease tank.)
   - In the beginning if have oil and grease. Try to make it under water otherwise the oil and grease will be on the top of surface that will be slowly digested
3. **Sampling**: any volume
4. **Equipment and tank for testing:**
   - Testing should be in a fish tank that can clearly reveal the appearance of tank water. It may be 3 tanks. (1. control, 2. waste water, 3. sludge)
   - Aeration that can create movement of water and add oxygen simultaneously, such as a blower to make water flow and to add oxygen.
5. **Dosage and period** :
   - 3 ppm up in the first day
   - 2 ppm up in the day 2-4
   - 1 ppm onward from the day 5

   Period: around two weeks

6. **Measurement** of performance
   Frequency: once per day (if possible)

   Key indicators:

   - BOD, COD
   - DO
   - SS
   - TSD
   - pH
   - MLSS and SV 30 (Before and after)
   - Odors such as H_2S, Ammonia, Mercaptan, Nitrate, Nitrite if Volatile Organic Compound exists may be checked as well.

7. Method/Procedure
   - Clean all equipment, tanks
   - Add sample of waste water to each tank (3-4 tanks) and check the key indicator before testing.
   - Mixing SEPT-X with water (just to make it soluble), then adding to the sample.
     - No 1. Control: no need to add SEPT-X
     - No. 2. Waste water
     - No. 3. Sludge
     - A control for sludge may be created as well.

   - Aerate by adding oxygen or blower that creates water flow
   - Begin checking key performance
   - Add SEPT-X every day per the above dose for two weeks.